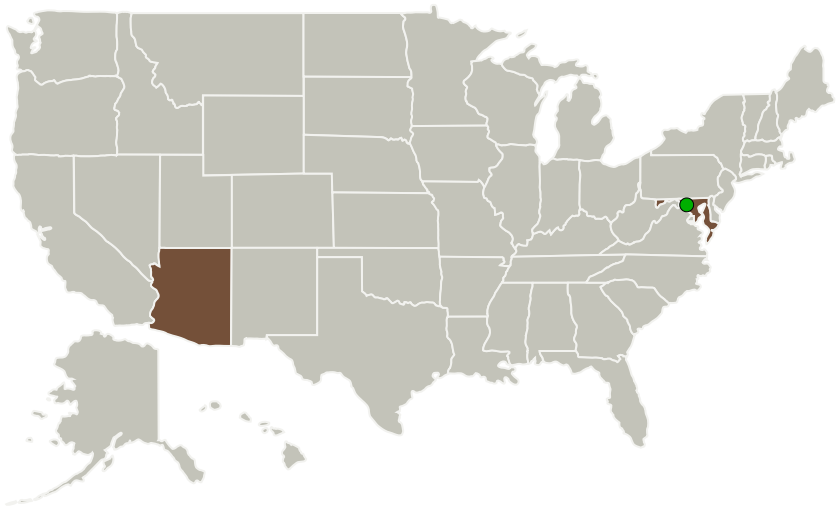
Low Coherence Wavefront Probe for Nanometer Level Free-Form Metrology, Phase I

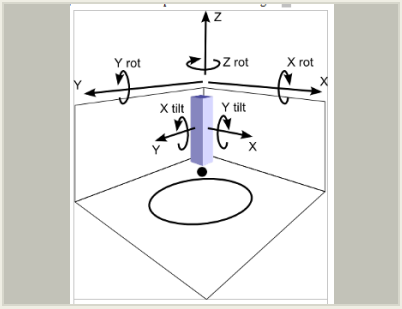
Completed Technology Project (2016 - 2016)

Project Introduction

We propose an innovative, low coherence probe for rapid measurement of free-form optical surfaces based on a novel method of spectrally controlled interferometry. The key innovations are the use of a new interferometric modality and a novel non-contact optical probe that together measure high surface slope acceptance angles to nanometer sensitivity. When the probe is integrated with a precision motion, x, y, & z metrology frame (Phase II) (see Figure-1), it will meet NASA's need to measure free-form optical surfaces from 0.5 cm to 6 cm diameter ranging from F/2 to F/20, including slopes up to 20 degrees (with potential for 60 degrees), with an uncertainty targeted at 2 nm RMS. The probe operation does not require tilting to measure slopes. This results in this simplified cartesian metrology frame, also critical to achieve 2 nanometer measurement uncertainty. These features: nanometer resolution and 20 degree slope acceptance angle, have up to this time not been found in a single probe or sensor, non-contact or contact. This proposal integrates the spectrally controlled source and breadboard probe developed under a previous SBIR to develop a practical detection method reading the technology for a successful SBIR Phase II project.

Primary U.S. Work Locations and Key Partners





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Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Apre Instruments, LLC	Lead Organization	Industry	Tucson, Arizona
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Arizona	Maryland

Project Transitions

June 2016: Project Start

December 2016: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139886)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Apre Instruments, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

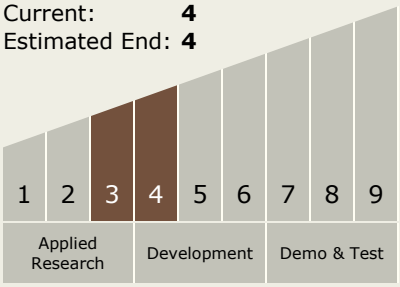
Carlos Torrez

Principal Investigator:

Artur Olszak

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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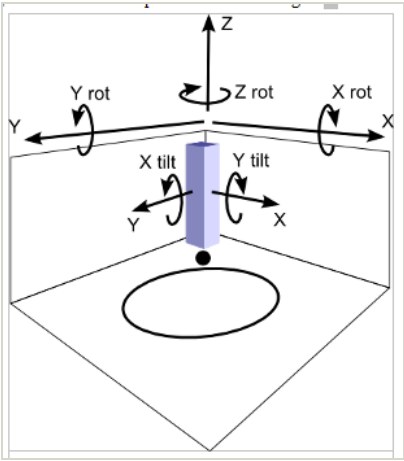
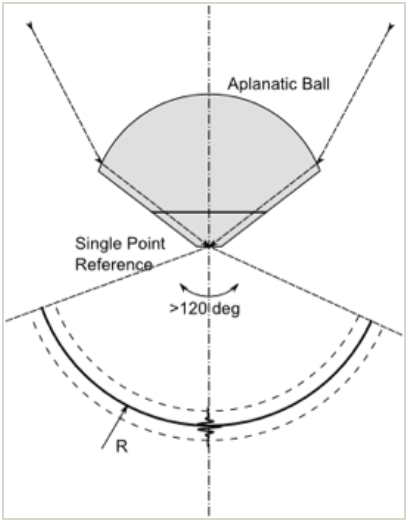
Images



Briefing Chart Image
Low coherence wavefront probe for nanometer level free-form metrology, Phase I *(https://techport.nasa.gov/image/136325)*



Final Summary Chart Image
Low coherence wavefront probe for nanometer level free-form metrology, Phase I Project Image *(https://techport.nasa.gov/image/136846)*

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.2 Observatories
    - TX08.2.1 Mirror Systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System